Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C. 20554

In the Matter of	)	
	)	
Elefante Group, Inc.	)	
	)	
Petition to Modify Parts 2 and 101	)	**RM No. 11809**
Of the Commission's Rules to	)	
Enable Timely Deployment of Fixed	)	
Stratospheric-Based Communications	)	
Services in the 21.5-23.6, 25.25-27.5,	)	
71-76 and 81-86 GHz Bands	)	

COMMENTS OF AUDACY CORPORATION

Audacy Corporation ("Audacy"), by its undersigned attorneys, and pursuant to the June 11, 2018 *Public Notice* in the above-captioned docket,[1] hereby submits comments in response to Elefante Group, Inc.'s ("Elefante") Petition for Rulemaking to modify Parts 2 and 101 of the Commission's Rules to enable stratospheric balloon-based communications ("Petition").[2]

I. AUDACY STATEMENT OF INTEREST

Audacy was launched in 2015 by a team of Stanford University graduates, National Aeronautics and Space Administration ("NASA") award winners, and Space Exploration Technologies Corp. ("SpaceX") veterans. Audacy's space-based data relay constellation (the "Audacy Network"), licensed under Call Sign S2982,[3] will provide Non-Geostationary ("NGSO") spacecraft users with continuous, high-speed, low-latency communications, through the deployment and operation of three Medium Earth Orbit ("MEO") relay satellites and two

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[1] *See* FCC Public Notice, *Consumer & Governmental Affairs Bureau Reference Information Center Petition for Rulemakings Filed*, Report No. 3093, released June 11, 2018 (setting Comment deadline of July 11, 2018) ("*Public Notice*").

[2] *See Petition to Modify Parts 2 and 101 of the Commission's Rules to Enable Timely Deployment of Fixed Stratospheric-Based Communications Services in the 21.5-23.6, 25.25-27.5, 71-76, and 81-86 GHz Bands*, Petition for Rulemaking, RM-11809 (filed May 31, 2018).

[3] *See Audacy Corporation Application for Authority to Launch and Operate a Non-Geostationary medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Services*, FCC 18-72, Order and Authorization, IBFS File No. SAT-LOA-20161115-00117 (rel. June 6, 2018) ("Audacy Grant Order").

initial Gateway earth stations ("Gateways"). Audacy's system architecture promotes highly efficient use of spectrum, employing extensive frequency reuse to provide communication to thousands of user platforms simultaneously, easing the burden on not only regulatory authorities but also on satellite operators themselves, who will no longer need to build out extensive ground infrastructure to access to their spacecraft.

The Audacy Network, targeting launch and commencement of operations in 2020, will provide communication services to and from its users via internationally allocated K-band Inter-Satellite Service ("ISS") spectrum, and to and from Gateways using internationally allocated V-band Fixed Satellite Service ("FSS") spectrum. The inter-satellite service frequencies in the 22.55-23.18 and 23.38-23.55 GHz bands, which are the subject of Elefante's petition, are critical to Audacy's core operations.

Elefante's instant proposal is highly speculative – it does not appear to have a prototype airship that has been tested for "air worthiness, station keeping, and helium retention for long duration missions;"[4] it does not propose particular frequencies for cross-links;[5] and proposes a tight timeframe between prototype testing in late 2021 and deployment of "operational flights and commercial communications" as soon as 2022.[6] Should the Commission give further consideration to this proposal, Audacy urges the Commission to do so under a new rule part in a proceeding that develops fulsome technical and operational parameters tailored to HAPS' unique characteristics and which adequately safeguards existing and already authorized operations.

II. THE DEMAND FOR HAPS-BASED COMMUNICATIONS IN THE ALREADY HYPER-COMPETITIVE U.S. DOMESTIC COMMUNICATIONS MARKET REMAINS UNCLEAR

Elefante asserts that its stratospheric based communications would contribute to U.S.

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[4] Petition at 20.

[5] *Id*.

[6] *Id*., at 21.

efforts to "win the race to 5G."[7] However, beyond suggestions that its proposed balloon-based communications "could support 4G/5G cellular backhaul and network densification as well as filling in coverage gaps of providers in urban and rural areas;"[8] Elefante Group provides little evidence to support the assertion that balloon-based communications would present a cost-effective, practical, or efficient option for carriers to build-out 5G networks in the United States, *vis-à-vis* further development of existing terrestrial infrastructure.

First, while Elefante purports that its "studies indicate that the reduction in cost, both upfront and during the ongoing provision of service, will reduce link costs within a metro area by 70-90% on average over ground-based deployments,"[9] it does not actually make these studies available for review.

Second, while some parties may view HAPS technology as viable for backhaul or to fill coverage gaps in the buildout of a 5G network, several recent HAPS initiatives have abandoned their efforts completely or delayed entry into the U.S. market.[10]

Third, the concept of a high-throughput HAPS network has been recycled several times without gaining traction in the United States. The idea of a domestic HAPS network using "football field" sized balloons to deliver broadband connectivity can be traced back to the early-to mid-1990s.[11] Yet, while other technologies have flourished in the interim, no *en masse* HAPS deployment has occurred, and testing, research and development on HAPS technology during the intervening decades can be described as de minimis at best.

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[7] Petition at 6.

[8] Petition at 22.

[9] Petition at 25.

[10] Most recently Facebook and Google have pulled the plug on high altitude projects. *See. e.g., Facebook Cancels Program to Deliver Internet by Aquila Drones* (June 26, 2018), https://spectrum.ieee.org/tech-talk/telecom/internet/facebook-pulls-out-of-secret-spaceport-internet-drone-tests (noting that Facebook has "decided not to move forward with a high-altitude flight campaign" and that "in 2016, Google tested a 5G system called SkyBender …[but] terminated that 'moonshot' program in 2017."

[11] *See, e.g.*, https://www.washingtonpost.com/archive/business/1998/04/13/haig-floats-a-high-tech-trial-balloon/b7640a27-55ef-40f3-adbc-a9ca79d52897/?utm_term=.014176828383 (last visited, July 10, 2018).

In sum, while HAPS technology might be interesting from an academic standpoint, its practical commercial merits remain dubious. Audacy does not object to the further study of a regulatory framework that would facilitate HAPS, but cautions against a large investment in finite Commission resources without a strong commitment from broader industry stakeholders with respect to the development of an appropriate regulatory scheme to achieve harmonious integration into the wireless ecosystem.

II. REGULATION OF HAPS SHOULD NOT OCCUR UNDER THE FCC'S PART 101 TERRESTRIAL MICROWAVE RULES

The Commission's long-standing and well-understood Part 101 Rules do not permit or contemplate in-motion, balloon-based HAPS communications, and the operation of such itinerant transmitters, even if loosely station-kept, cannot be reconciled with the universal principles that Part 101 microwave services involve land-based transmitters whose position is fixed and precisely known.[12]

The scope of the Commission's Part 101 rules narrowly encompasses fixed service "microwave operations that require transmitting facilities on land or in specified offshore coastal areas within the continental shelf,"[13] and the Part 101 rules unambiguously define a "fixed service" as "a radio communications service between specified fixed points."[14]

The service rules promulgated under Part 101 require operational precision that a balloon-based or HAPS network cannot maintain. For example, point-to-point microwave links must remain in a fixed location without meaningful deviation in geographic coordinates, antenna height or antenna elevation angle. Specifically, all point-to-point microwave communications

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[12] *See* 47 C.F.R. § 1.77(i) ("Rules governing applications for authorizations in the Common Carrier and Private Radio *terrestrial* microwave services and Local Multipoint Distribution Services are set out in part 101 of this chapter." (emphasis added)); *Reorganization and Revision of Parts 1, 2, 21, and 94 of the Rules to Establish a New Part 101 Governing Terrestrial Microwave Fixed Radio Services, et al.*, WT Docket No. 94-148, CC Docket No. 93-2, Report and Order, 11 FCC Rcd 13449 (1996); Memorandum Opinion and Order and Notice of Proposed Rule Making, WT Docket No. 94-148, 15 FCC Rcd 3129 (2000).

[13] 47 C.F.R. §101.1 (emphasis added).

[14] 47 C.F.R. §101.3.

require that the "position location of antenna sites shall be determined to an accuracy of no less than ±1 second in the horizontal dimensions (latitude and longitude) and ±1 meter in the vertical dimension (ground elevation) with respect to the National Spatial Reference System."[15] Any change in transmitter location by more than 5 seconds in latitude or longitude; increases of transmit antenna height by more than 3 meters; or change in transmit antenna azimuth greater than 1 degree would be treated as a major modification under the Commission's rules, requiring a new approval from the FCC, in addition to an independent interference coordination.[16]

Band-specific rules applicable to the wireless spectrum proposed by Elefante impose additional obligations that a balloon-based network cannot satisfy. For example, Part 101 microwave links share the E-band (71-76 GHz and 81-86 GHz) with co-primary federal services that require interference protection and prior coordination of links.[17] To ensure federal incumbent services comprehensive interference protection, proposed E-band links are painstakingly coordinated on a case-by-case basis through FCC-approved databases that interface with an NTIA database.[18] The requisite technical inputs for such coordination include antenna centerline (m AGL), azimuth, and elevation angle, all of which will be in a perpetually dynamic state for balloon-based antennas, and/or the ground stations communicating with such antennas.[19] Neither the databases implemented by the FCC to permit E-band operations nor the federal database that approves or rejects E-band link registrations can accommodate coordination in real time as a loosely station-kept balloon alters its course or altitude, and makes commensurate adjustments while in motion to the azimuth and elevation of its communications antennas.

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[15] 47 C.F.R. § 101.103(d).

[16] 47 C.F.R. § 1.929(d)(1).

[17] 47 C.F.R. § 101.1523.

[18] *See Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-96 GHz Bands*, WT Docket No. 02-146, Report and Order, 18 FCC Rcd 23318, 23339-43 (2003).

[19] *See id.*, App'x C: Required Link Data.

Attempting to operate Elefante's HAPS network under the above Part 101 regulatory framework is akin to forcing a giant round balloon into a tiny square hangar. Elefante's balloons simply do not share the core characteristics of a Part 101 fixed service terrestrial microwave. Elefante's balloons are neither land-based, nor are they horizontally or vertically fixed. In fact, Elefante candidly acknowledges that it will only station-keep its balloons horizontally within a 10-kilometer radius, and will operate the balloons between 18-26 kilometers of altitude.[20] Accordingly, even if Elefante were to improve its horizontal and vertical station-keeping by an order of magnitude, its balloon-based antennas would still fall far outside Part 101 tolerances. The high degree of precision universal to all Part 101 transmitters simply cannot be accommodated with untethered, loosely station-kept balloons, and the Part 101 rules should not be contorted and tortured solely for the sake of expedience to accommodate such a service.

III. IF DEMAND EXISTS, A NEW AND DISTINCT RULE PART FOR HAPS WOULD BETTER SUPPORT ELEFANTE'S PROPOSAL

Elefante's balloon-based communications proposal represents a near-textbook example of a HAPS system. The FCC and International Telecommunications Union ("ITU") both define HAPS as "a [radio] station located on an object at an altitude of 20 to 50 km."[21] Elefante proposes to operate its balloon-based antennas from an altitude of "18 to 26 km altitude and [within a] 10 km radius."[22] Given these similarities, instead of referring to its proposed balloon-based antennas as "HAPS-like," Elefante would be better served dropping the "-like" and acknowledging that its network is a straightforward HAPS proposal. Moreover, to the extent that the instant record ultimately evidences strong demand for a service such as that proposed by Elefante in the Petition, which as discussed above, remains murky at best, the Commission should consider the creation of a new rule part for HAPS service and conduct a fulsome

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[20] *See* Petition at 86.

[21] *See* 47 C.F.R. § 2.1; ITU-RR 1.66A.

[22] Petition at 5.

evaluation of current HAPS allocations available on a primary or secondary basis that will not disrupt incumbent operations.

The creation of a new rule part for HAPS gives Elefante and future applicants a better opportunity to develop bespoke rules more appropriate for balloon-based antennas that at best can be described as nominally fixed. Under a new rule part, the appropriate technical service rules for HAPS can be investigated without the need to comport with Part 101 terrestrial microwave rules, which an untethered balloon operating in the stratosphere cannot satisfy. Among other novel and critical issues, station-keeping tolerance, pointing accuracy (for balloons and ground stations) and the need to mute transmissions during incidences of mispointing are better evaluated and implemented under a new rule part, as opposed to an existing rule part where these issues have not arisen and are unlikely to arise in the future.

Unique safety concerns not relevant to existing rule parts, and the need to dovetail FCC rules with likely Federal Aviation Administration ("FAA") obligations, must also be addressed.[23] For example, balloon-based operations pose safety hazards due to their size and the unpredictability of atmospheric conditions. Moreover, unlike satellite services, which are also equipped to provide backhaul and fill coverage gaps, HAPS must cross navigable airspace and land on a periodic basis for servicing, which is no small feat for balloons of the magnitude that Elefante is proposing. Elefante's proposed airship would be approximately two million cubic feet.[24] For perspective, a Boeing 747 has an internal capacity of approximately 31,000 cubic feet; a Goodyear blimp runs between 200,000 and 300,000 cubic feet.[25] An accident on landing could have dire consequences for manned flight operations or for those on the ground.

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[23] The Petition does not discuss the process for an expedited or emergency landing in the event of a technical problem, the protocol for passing through navigable airspace, or the specifics of the station-keeping system.

[24] Petition at 20.

[25] *See* Boeing 747-Fun Facts, http://www.airliners.net/forum/viewtopic.php?t=176707; Goodyear-Current Blimps, https://www.goodyearblimp.com/behind-the-scenes/current-blimps.html. Elefante's proposed

V. ELEFANTE MUST EXPLAIN THE RESOLUTION OF INTERFERENCE CONCERNS WITH AUDACY'S AUTHORIZED NGSO NETWORK

In 2017, Elefante filed substantive comments in response to Audacy's NGSO application, asserting that Audacy's relay-to-user downlink operations in the 22.55-23.55 GHz band "would create serious potential for harmful interference to Elefante Group's ground receivers."[26] While Audacy responded that no HAPS allocation or service rules exist for the 22.55-23.55 GHz band and moreover that neither the Commission nor the ITU are contemplating HAPS allocations in the 22.55-23.55 GHz band,[27] Elefante Group pressed that additional information was needed to for "spectral compatibility and potential ability of Audacy and other services in the 22.55-23.55 and 24.45-24.75 GHz bands to share can be appropriately assessed."[28]

In its recent order granting authority for Audacy's constellation, the Commission declined Elefante's request that Audacy's third-party customer User Satellites be required to operate without protection from fixed services, noting that "non-federal ISS and fixed services are co-primary under the U.S. Table of Frequency Allocations, and requiring ISS operations to operate without protection would be inconsistent with that co-primary allocation."[29]

In a notable change of course, in the instant Petition, Elefante declares its belief that its proposed operations would be able to "operate compatibly" with Audacy's system.[30] Elefante

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airship would be slightly less than one-third the size of the Hindenburg, which was approximately 7 million cubic feet. *See* LZ-129 Hindenburg: A Detailed History, http://www.airships.net/hindenburg/lz129-hindenburg-detailed-history/.

[26] *Audacy Corporation Application for Authority to Launch and Operate a Non-Geostationary medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Services*, FCC 18-72, IBFS File No. SAT-LOA-20161115-00117, Comments of Elefante at 11 (filed June 26, 2017).

[27] *Audacy Corporation Application for Authority to Launch and Operate a Non-Geostationary medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Services*, FCC 18-72, IBFS File No. SAT-LOA-20161115-00117, Audacy Opposition and Response at 16-19 (filed July 7, 2017).

[28] A*udacy Corporation Application for Authority to Launch and Operate a Non-Geostationary medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Services*, FCC 18-72, IBFS File No. SAT-LOA-20161115-00117, Elefante Reply Comments at 10 (filed July 14, 2017).

[29] Audacy Grant Order at 17, n. 129 (declining Elefante Group's request that Audacy's third-party customer User Satellites be required to operate without protection from fixed services).

[30] Petition at 64.

fails to reconcile its current assertions with its prior statements expressing significant concerns with respect to potential interference and provides a compatibility assessment evaluating interference using "worst-case operational and geometric assumptions," concluding such events would be "unlikely and transient." [31]

As a threshold matter, it is unclear why Elefante Group's results show that their more powerful Enterprise UTs appear to cause *less* harmful interference than their Consumer UTs, though perhaps Elefante inadvertently inverted their Consumer and Enterprise results. In addition, in its interference analysis, Elefante did not consider the potential of its proposed system to cause harmful interference into omnidirectional LEO satellites in the ISS service. All LEO satellites have an omni-directional antenna so that the satellite can achieve a link in any orientation including during periods of uncontrolled tumbling. Assuming a gain of 2 dBi, such an omnidirectional system would have a G/T of around -27 dB/K in the direction of the earth and of Elefante's proposed uplink signals. An analysis of the worst-case interference caused by Elefante's proposed uplinks into a victim LEO receiver, using the same inputs as Elefante themselves used, is shown below.

	Elefante UT	Consumer	Enterprise
I/N Margin	**dB**	**0.2**	**-7.8**

The above analysis shows that Elefante's proposed system's uplinks are as damaging to LEO users as they are to Audacy's MEO satellites. Although interference events are transient, there are anticipated to be a multitude of LEO users of ISS frequencies, so interference events will be frequent. Given the omnidirectional link's primary uses for essential satellite health data and critical commanding in off-nominal and emergency situations, any interruption to this link could have a negative impact on the satellite, potentially including loss of the vehicle.

[31] S*ee* Petition, App'x D.

The challenge of mitigating the potential harmful interference caused by Elefante's proposed system into LEO operations is compounded by the itinerant nature of Elefante's stratospheric stations. Because the proposed stations would not be fixed in position, but move around with winds and weather, interference events are challenging, potentially even impossible, to predict and thus would render avoidance measures impractical.

V. CONCLUSION

Elefante's Petition and proposed HAPS network are highly speculative. Several HAPS efforts have failed to date and the Commission cannot give credence to Elefante's vague claims about the advantages of its technology. Even if the Commission is to consider Elefante's proposal, Part 101 of the Commission Rules is not the place to do so, as Elefante's platforms are itinerant and not fixed. If demand for Elefante's services exists, a new and distinct FCC rule part for HAPS would better support Elefante's proposal. Finally, Elefante must clearly explain the resolution of potential interference concerns with Audacy's recently licensed NGSO network.

Respectfully submitted,

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Dated: July 11, 2018